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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/603,302	06/25/2003	Song Wu	TI-33763	5280
23494 7590 03/21/2007 TEXAS INSTRUMENTS INCORPORATED P O BOX 655474, M/S 3999 DALLAS, TX 75265			EXAMINER JOSEPH, JAISON	
			ART UNIT	PAPER NUMBER
			2611	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/21/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	10/603,302	WU ET AL.	
	Examiner	Art Unit	
	Jaison Joseph	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 29 December 2006.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-25 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Response to Arguments***

Applicant's arguments filed 12/29/2006 have been fully considered but they are not persuasive.

Regarding claim 1 – 4, and 23 – 25, applicant argue, "Claim 1 includes.... the references of record". However Examiner respectfully disagrees. Figure 1 of Sawada teaches a prefilter 12 (feed forward filter) coupled to an input for producing in response to input analog communication signal (see input signal to the prefilter 12) an equalized analog communication signal (see figure 1, output signal to adder 13, and page 1, paragraph 0004). Thus Sawada does teach all cited limitations. Therefore Examiner maintains his rejection of claims 1 – 4, and 23 – 25.

Regarding claim 13 – 16, Applicant argues, " Yang reference does not disclose defining control information based on feedback coefficients used by a decision feedback equalizer". However Examiner respectfully disagrees. Yang et al does teach control information based on feedback coefficients used by a decision feedback equalizer (see column 5, lines 35 – 50 and column 6, line 3 – 40). Thus Yang et al do teach all cited limitations. Therefore Examiner maintains his rejection of claims 13 – 16.

Regarding claim 17 and 18, Applicant argue that, "Sawada reference does not disclose an equalizer having a control input for receiving an equalizer coefficient and further responsive to said equalizer coefficient for producing said equalized communication signal". However Examiner respectfully disagrees. Sawada et al teach a decision feedback equalizer apparatus comprising: an input for receiving an input

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communication signal (see figure 1, input signal to the pre-filter 12), an output for providing an equalized communication signal (see figure 1, the output signal of component 13), an equalizer coupled between said input and said output for providing said equalized communication signal in response to said input communication signal (see figure 1, component 16), said equalizer having a control input for receiving an equalizer coefficient (see figure 1, input signal to component 13 from component 16), said equalizer further responsive to said equalizer coefficient for producing said equalized communication signal and a coefficient adapter apparatus coupled to said equalizer for producing coefficient (see figure 1, component 13, 14, 15, 16, 17, 19). The output of feedback equalizer (the output signal of component 13) is controlled by the output signal from component 16 (see figure 1). Component 16 is generating feedback equalizer coefficients. Therefore Sawada does teach said cited limitations. Thus Sawada in view of Drost et al teach all cited limitations. Therefore examiner maintains his rejection of said claims 17 and 18.

### ***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1 – 4, 11, 12, 23 - 25 are rejected under 35 U.S.C. 102(e) as being anticipated by Sawada et al. (USPAP 2003/0058930).

Regarding claim 1, Sawada et al teach a communication receiver comprising an input for receiving from a communication transmission apparatus an input analog communication signal (see figure 1, input signal to the pre-filter 12), a feed-forward equalizer coupled to said input for producing in response to said input analog communication signal and equalized analog communication signal (see figure 1, component 12, and 13), a sampler coupled to said feed-forward equalizer for producing digital communication information in response to said equalized analog communication signal (see figure 1, component 14), and a feedback equalizer coupled between said sampler and said feed forward equalizer for controlling said feed forward equalizer in response to said digital communication information (see figure 1, component 16).

Regarding claim 2, which inherits the limitations of claim 1, Sawada et al further teach said feed forward equalizer includes a wire summation node (see component 13).

Regarding claim 3, which inherits the limitations of claim 1, Sawada et al further teach said feedback equalizer includes a digital to analog conversion portion having an input coupled to said sampler for receiving said digital communication information (see figure 1, component 19), said digital to analog conversion portion having an output coupled to said feed forward equalizer (see figure 1, output signal from component 19 to component 13).

Regarding claim 4, which inherits the limitations of claim 3, Sawada et al further teach said feed forward equalizer includes a wire summation node (see component 13).

Regarding claim 11, which inherits the limitations of claim 1, Sawada et al further teach said feedback equalizer includes a control input for receiving control information, said feedback equalizer responsive to said control information for controlling said feed forward equalizer, said control information designed to minimize interference at temporal boundaries between data symbols carried by said equalized analog communication channel (see figure 1, component 17, the inputs w0-w7).

Regarding claim 12, which inherits the limitations of claim 11, Sawada et al further teaches said input analog communication signal is produced by the communication transmitter apparatus in response to second control information (see figure 1, the output signal of component 14), said first control information designed in conjunction with the second control information to minimize interference at points in time between said temporal boundaries (see figure 1, components 13, 14, 15 and 16).

Regarding claim 23, the claimed method including the features corresponds to subject matter mentioned in above rejection of claim 1 is applicable hereto.

Regarding claim 24, which inherits the limitations of claim 23, Sawada et al further teach converting said digital communication information into an analog control signal, and performing said feed forward equalization step in response to said analog control signal (see figure 1, component 14, 15, 16, 17 19).

Regarding claim 25, which inherits the limitations of claim 24, Sawada et al further teach said analog signal is a current signal.

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3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claims 13 – 16 are rejected under 35 U.S.C. 102(a) as being anticipated by Yang et al (US Patent 6,469,988).

Regarding claim 13, Yang et al teach an input for receiving digital communication information, a digital to analog conversion portion coupled to said input for producing an analog communication signal in response to said digital communication information (see column 4, lines 66 – column 5, lines 5), an output coupled to said digital to analog conversion for providing said communication signal for transmission to communication receiver apparatus, said digital to analog conversion portion having a control input for receiving control information, said digital to analog conversion portion for producing said analog communication signal in response to said control information (see column 5, lines 22 – 49), said control information defined based on feedback coefficients used by a decision feedback equalizer in a communication receiver (see column 6, lines 3 – 40).

Regarding claim 14, which inherits the limitations of claim 13, Yang et al further teach said digital to analog conversion portion includes plurality of current source digital to analog signal converters and wherein said control information includes weight information for indicating respective amounts of current to be sourced by said current source digital to analog converters (see abstract and column 2, lines 18 – 40).

Regarding claim 15, which inherits limitations of claim 13, Yang et al further teach said control information is defined in conjunction with feedback coefficients to minimize interference at points in time between temporal boundaries of data symbols carried by an equalized communication signal produced by the decision feedback equalizer (see column 6, lines 3 – 40).

Regarding claim 16, which inherit the limitations of claim 15, Yang et al further teach wherein the feedback coefficients are defined in conjunction with said information to minimize interference at said temporal boundaries.

### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 5 – 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sawada et al. (USPAP 2003/0058930) in view of Yang et al (US Patent 6,469,988).

Regarding claim, which inherits the limitations of claim 3, Sawada et al is silent on said digital to analog conversion portion includes plurality of digital to analog converters having respective inputs coupled to said sampler and respective outputs coupled to said feed forward equalizer. However, in analogous art, Yang et al teach an filter having digital to analog conversion portion includes plurality of digital to analog converters having respective inputs coupled to said sampler and respective outputs



coupled to said feed forward equalizer (see abstract). Therefore it would be obvious to an ordinary skilled in the art at the time the invention was made to incorporate the teachings of plurality of digital to analog converters in Sawada et al filter. The motivation or suggestion to do so is to realize plurality of tap coefficients (see column 2, line 12 – 40).

Regarding claim 6, which inherits the limitations of claim 5, Yang et al further teach each of the said digital to analog converters includes a current source digital to analog converter (see column 2, line 18 – 40).

Regarding claim 7, which inherits the imitations of claim 6, Yang et al further teach said outputs of said digital to analog converters are connected together at an input of said feed forward equalizer (see column 2, lines 18 –40).

Regarding claim 8, which inherits the limitations of claim 5, Yang et al further teach said feed forward equalizer includes a wire summation node (see column 2, lines 18 – 40).

Regarding claim 9, which inherits the limitations of claim 5, Sawada et al further teach said feedback equalizer includes a delay apparatus coupled between said sampler and said digital to analog converters for providing said digital communication information to said digital to analog converters at different point in time (see abstract and column 2, lines 18 – 40).

6. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sawada et al. (USPAP 2003/0058930) in view of Peon et al (US patent 7027499).

Regarding claim 10, Sawada et al is silent on the communication signal carries a SONET communication. However in analogous art, Peon et al teach communication system carries a SONET signal. Therefore it would be obvious to an ordinary skilled in the art at the time the invention was made to have process the SONET signal.

Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sawada et al. (USPAP 2003/0058930) in view of Drost et al (US Patent 6,055,269).

Regarding claim 17, Sawada et al teach a decision feedback equalizer apparatus comprising: an input for receiving an input communication signal (see figure 1, input signal to the pre-filter 12), an output for providing an equalized communication signal (see the output signal of component 13), an equalizer coupled between said input and said output for providing said equalized communication signal in response to said input communication signal (see figure 1, component 16), said equalizer having a control input for receiving an equalizer coefficient (see figure 1, input signal to component 13 from component 16), said equalizer further responsive to said equalizer coefficient for producing said equalized communication signal and a coefficient adapter apparatus coupled to said equalizer for producing coefficient (see figure 1, component 13, 14, 15, 16, 17, 19).

Sawada et al is silent in adaptor apparatus producing the coefficient in response to a temporal relationship between first and second point in time. However in analogous art, Drost et al teach a decision feedback equalizer generate the coefficients based on temporal relationship between first and second points in time (see column 12, lines 31 –

46). Drost et al further teach first point corresponds to actual occurrence of a temporal boundary between data symbols carried by the equalized communication signal, said second point in time corresponding to an expected occurrence of said temporal boundary, and said coefficient adaptor apparatus for iteratively adapting said equalizer coefficients in response to said temporal information (see column 12, lines 31 – column 16 – line 40). Therefore, it would be obvious to an ordinary skilled in the art at the time the invention was made to use temporal information to adapt the filter coefficients. The motivation or suggestion to do so is to reduce the complexity and additional circuitry in the receiver.

Regarding claim 18, which inherits the limitations of claim 17, Drost et al further teach wherein said temporal relationship indicates when said first point precedes said second point in time and also indicates when said second point in time precedes said first point in time (see column 12, line 31 – 46 determining the signal is either early or late).

Regarding claim 19, Sawada et al further teach said coefficient adaptor apparatus includes logic for producing, in response to said temporal relationship information, equalizer information indicative of how said equalized communication signal is affected by a current version of said equalizer coefficient (see figure 1, component 13, 14, 15, 16, 17, 19).

Regarding claim 20, which inherits the limitations of claim 19, wherein said coefficient adaptor apparatus includes a coefficient adaptor coupled to said logic and having an input for receiving said current version of said equalizer coefficient, said

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coefficient adaptor responsive of said equalizer information for adapting said current version of said equalizer coefficient to produce a corresponding adapted version of said equalizer coefficient (see figure 1, component 13,14, 15, 16, 17, 19).

Claims 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sawada et al. (USPAP 2003/0058930) in view of Drost et al (US Patent 6,055,269) and further in view of Melas (US Patent 6,678,105)

Regarding claim 21, which inherits the limitations of claim 19, Sawada et al in view of Drost et al is silent on said logic includes a lookup table. However in analogous art, Melas teaches said logic includes a lookup table (see column 1, line 50 –60). Therefore it would be obvious to an ordinary skilled in the art at the time the invention was made to incorporate the lookup table in the filter. The motivation or suggestion to do so is to remove trailing nonlinear ISI that exists in the feed forward filter output.

Claims 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sawada et al. (USPAP 2003/0058930) in view of Drost et al (US Patent 6,055,269) and further in view of Lee et al (US Patent 5,471,504)

Regarding claim 22, Sawada et al in view of Drost et al is silent on said adaptor is using a LMS algorithm to calculate the equalizer coefficient. However in analogous art Lee et al teach computing decision feedback equalizer coefficients using iterative LMS algorithm (see column 2, lines 53 –62). Therefore it would be obvious to an ordinary skilled in the art at the time the invention was made to use LMS algorithm to calculate the filter coefficients. The motivation or suggestion to do so is reduce the complexity in the equalizer.

***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jaison Joseph whose telephone number is (571) 272-6041. The examiner can normally be reached on M-F 9:30 - 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chieh Fan can be reached on (571) 272-3042. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Jaison Joseph  
03/15/2007

  
**CHIEH M. FAN**  
**SUPERVISORY PATENT EXAMINER**